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zeit) covered the first five centuries of our era and are treated by the authors as a unit. The first two hundred years of the Roman period witnessed but little change in the local La Tène culture. By the third century there was at least indirect communication with the highly developed culture of southern Russia.

The art of the following Merovingian period (500–800 A. D.) was marked by a certain richness and splendor hitherto unknown. The making over of the Thüringian monarchy into a Frankish province in 531 A. D. was followed by important cultural changes such as the introduction of Merovingian ornaments and weapons as well as of the Frankish mode of burial. The Slavic invasion began in the sixth century and its influence was felt till about 1000 A. D.

The greater part of the volume is devoted to an inventory of the finds which may be considered as the text to the valuable archeological map. While the arrangement is geographical, the period to which each find belongs is also indicated. The forty pages of bibliography, index of places, and the 379 high-grade illustrations complete a work of prime importance in the development of the archeology of the Fatherland.

GEORGE GRANT MACCURDY.

Mental and Moral Heredity in Royalty. A Statistical Study of History and Sociology. By FREDERICK ADAMS WOODS, M.D. New York: Henry Holt & Co., 1906. 12°, viii, 312 pp., ill.

In this work Dr Woods has attempted to apply modern scientific methods to the study of history. One needs to study the whole book carefully to appreciate the importance of the results which have come from this study. The book is a remarkable one and deserves the attention of both biologists and sociologists.

The original records from which history is written are largely *ex parte* statements whose views were colored by personal interest, often by imperfect knowledge, and frequently by strong prejudices. To get at the truth may perhaps be impossible in many cases, but the application of scientific methods of weighing evidence can be made to reveal the most probable interpretation of the data. While Dr Woods has not attempted in this volume extensive interpretation of historical data on the basis of the studies made, he seems to have demonstrated that the heredity of those who have had most influence in shaping the course of human events is a factor which the historian can not overlook without great loss. He has studied the relative influence of heredity and environment on the mental and moral traits of royalty. This class was selected for two reasons: first, because of the preponderating influence royal personages have had on the course of events; second, because the preservation of pedigree records and information as to the mental and moral traits of royal personages are more nearly complete than is the case with any other class of people who have had an important influence on history.

The mental and moral status of each individual was determined by an exhaustive research in all available records, but principally in biographical dictionaries. From the best information obtainable each person is graded on a scale of 10 for both mental and moral traits. Scientific methods are applied to test the reliability of the grades assigned. The law of probability requires that the distribution of a given number of individuals amongst the grades should correspond more or less closely to the well-known frequency curve, the larger number of individuals occurring in the intermediate grades, the numbers shading off at the extremes. The number of individuals in each of the grades, as shown on pages 19 and 32, correspond remarkably well to the requirements of the law of probability. This fact adds great weight to the probability of the correctness of the grades assigned.

Another reason why the study was confined to royalty lies in the fact that we may assume for this class the most favorable environment. If environment is highly important in determining mental and moral traits, royalty should be superior in these respects. Dr Woods assumes that the mental, moral, and physical characteristics of the individual are the resultant of three causes, namely, heredity, environment, and free will. The present study is an effort to study the relative importance of these three factors in the production of character. The author might perhaps have made his meaning a little more clear in his reference to the latter cause, but as the study relates mainly to the one factor, heredity, the shortcoming is not a serious one. Subsidiary questions investigated are the effect of inbreeding, the relation of genius to insanity and sterility, and the relation between the rise of a country and the character of the blood of its kings.

The following quotation sums up in a general way the conclusion to which the study has led: "The most interesting and even startling thing has been the ease with which heredity alone has been able to bear the brunt of explaining the general make-up of character." The general impression the book gives is that this conclusion is justified, as will be seen in what follows.

Referring again to the grades given the various individuals, the number of individuals thus studied was 832. Frequency polygons were constructed for the grades for the two sexes separately so as to eliminate differences correlated with sex. This is fortunate, for the studies indicate a distinct correlation especially between sex and the grades for moral character. The author is careful to state that there are necessary defects in the grades, both for intellect and morals, but when one realizes the amount of careful work Dr Woods did in establishing these grades, it would seem doubtful if any one could have done the work more conscientiously. The whole tenor of the book impresses one with its fairness and the lack of preconceived notions on the part of the author. As might be expected, there is some evidence of alternative inheritance, as the author points out. For instance, the children of Frederick, Prince of Wales, whose grade for both intellect and morals is 3 on a scale of 10, and Augusta Saxe-Gotha, whose grade for intellect is 6 and for morals 4, were part dissipated like the father while others showed virtues characteristic of the mother's good family.

In speaking of physical characteristics the author says: "The features usually resemble only one of the two parents when the parents are dissimilar; or at least some one feature, nose, chin, eyes, may be easily referred to one of two parents rather than a blending of each." The whole book is well illustrated with portraits of the more important individuals studied.

The House of Brunswick is cited as a case of degeneracy in later generations hardly accounted for by heredity — that is, there are more degenerates than one should expect from hereditary influences alone, and this family is the only marked exception in this respect of all the families studied. The inheritance of genius is distinctly illustrated in the House of Hohenzollern.

The immediate beneficial effect of out-crossing is illustrated by the union of Henry II, Prince of Condė, with Charlotte of Montmorency. The latter stock contained much genius. Of three children two were in grade 10 for intellectuality. This is somewhat remarkable when it is remembered that only 14 out of 671 individuals graded for intellect were in this grade. In the next generation the introduction of blood tainted with degeneracy and insanity brought disastrous results. The family immediately declined, never to recover from the effects of this taint.

Henry IV of France and his children illustrate the results frequently found from the union of good and bad stock. His mother and maternal grandmother rank 9 and 10 for intellect respectively. His father was not brilliant. He himself ranked 9. He married poor stock. One child ranked 8, while two were weak and degenerate. That genius may pass over a generation is illustrated by Anne Marie, rated 10 for intellect, a daughter of one of the above degenerates. Further evidence that moral traits are hereditary is found in the fact that Peter the Cruel of Spain, an unspeakable monster, had, within five degrees of kinship, 8 out of 11 vicious or cruel; in six degrees of kinship, 11 out of 14 were thus classified. Peter therefore seems to have come honestly by his despicable character.

These facts all point to the importance of inheritance as a factor in character. Perhaps society must bear in some measure the responsibility for the propagation of vicious and criminal classes; the suffering inflicted on society by these classes is only a necessary retribution for the sins of omission.

It is seldom that the evidence is sufficient to demonstrate clearly a case of alternative inheritance in the studies made by Dr Woods, because in the case of any particular character which could be definitely identified from generation to generation the number of individuals concerned is always small. Yet there is evidence not only that physical characteristics, which can be identified, are alternative in their inheritance, but so far as there is evidence at all it indicates that mental and moral characters are similarly transmitted. In speaking of the Hapsburg lip the author says: "In almost every generation there were some who showed the peculiar lip and there were others who did not inherit it in any degree at all, and this is paralleled by the mental abnormality." This is just what we should expect if the inheritance of this character is alternative.

That there is correlation between mental and moral qualities is distinctly indicated, the coefficient of correlation being .34. This correlation is more striking in men than in women. One very interesting point brought out is a correlation between moral qualities and the number of adult offspring. The author suggests that this correlation furnishes a basis for the improvement of the race by natural selection, even under conditions so far removed from the struggle for existence as amongst royalty. This conclusion, which seems to be justified from the data given, deserves more than passing notice. Biologists, in considering the developmen of moral qualities by natural selection, have found difficulty in perceiving how altruistic tendencies could be favored by natural selection. If there is a correlation between moral qualities and the number of offspring which reach maturity, natural selection, in its action on fecundity, or rather the results of its mature progeny, would indirectly produce improvement in moral qualities.

The author thinks that amongst a given class, such as our foreign immigrants, this same correlation would hold. There would thus be a tendency toward moral improvement of the race. Biologists have hesitated to attribute development of moral qualities to natural selection. This slight but evident correlation suffices for the purpose if it holds within classes the individuals of which are comparable. The correlation between mental and moral qualities then means advancement of the races, both mentally and morally, due to forces hitherto little attended to. "The probability is that there are at work forces of natural selection of which we know little of the value as yet, but which are such that, setting aside all influences of environment, whether we will or not, the natural quality of humanity must progress."

The argument for the importance of heredity in explaining character is well substantiated by the facts given on pages 265 to 272, especially by the table on page 267, in which is represented graphically the number of eminent relatives — that is, whose grades for intellect are 9 or 10 — of of each grade from 1 to 10. The average number of eminent relatives of the individuals in classes 1 to 6 is approximately the same, whether we consider only the first degree of relationship or the first two degrees of relationship. But between grades 6 and 10, inclusive, the average number of eminent relatives of each person in these grades rises rapidly and quite regularly, the average number of such relatives in the case of individuals in grade 10 being more than four times as great as it is for individuals in grade 6, when the first two degrees of kinship are considered, and nearly three times when only the first degree of kinship is considered. The first degree of kinship is thus one and a half times as potent as the second.

Referring again to the evidence of alternative inheritance, on page 274 occurs the following statement: "The entire evidence in this research as we study families minutely and separately seems to be that both mental and moral qualities more often than otherwise do not thoroughly blend, but give us many examples of at least partial alternative inheritance."

The author states that he has not been able to detect the phenomenon of dominance. This statement is somewhat surprising, for there seems to be fully as much evidence of this phenomenon as there is of the segregation of characters in the Mendelian fashion. When we consider the difficulties of recognizing a moral or intellectual quality which might be transmitted as a Mendelian unit character, we are not surprised when the author says: "Although the mind seems in its inheritance to roughly obey the principle of alternative inheritance, and thus indicate segregation in the germ cells, I do not feel that this is sufficiently clearly defined to enable one to classify according to hard and fast types, as is possible in dealing with the features of certain plants and animals, like the colors of mice, whether albino or gray; or the shape of peas, whether round or angular. For these reasons I have not attempted to apply Mendel's principles."

Thus far the proof of the important part inheritance plays in the intellectual and moral qualities of individuals, while having been rendered highly probable, does not seem to be conclusively proven. It is gratifying, therefore, to find that Dr Woods has applied in his last chapter the more positive methods of investigating such questions. For instance, it is known that, for physical characters which can be definitely described, according to Galton's law the coefficient of correlation between the parent and offspring is $r = .300$; the correlation for similar characters between grandparents and their grandchildren is .150, and for great grandparents and their great grandchildren it is .075.

Not only is the assumption that intellect is transmitted as fully as are physical characters rendered highly probable, but the correctness of the grades assigned by Dr Woods are strikingly confirmed by the fact that when the grades for intellect are compared the correlation between the grades of parents and their offspring is $r = .3007$, which, within the limits of the probable error, agrees exactly with the corresponding correlation for physical characters.

For grandparents and their grandchildren the coefficient of correlation for intellectuality is .1606, and for great grandparents and their great grandchildren it is .1528. The two latter coefficients are larger than is the case for physical characters, as called for by Galton's law. It might be assumed that this unexpectedly high degree of correlation is due to the effect of environment; but this is not the case, as will be seen below.

The corresponding correlation coefficients for moral qualities are 2983 for parents and children, and .175 for grandparents and their grandchildren. That these correlations are not due to environment but are due to heredity is shown by the fact that the correlation between offspring and maternal grandfather is greater than it is between offspring and paternal grandfather. If it were due to environment the paternal grandfather, whose environment was more nearly similar to that of the grandchildren, should show closer correlation in mental and moral characters than the maternal grandfather, whose life was spent in a different court.

On the other hand, the greater correlation in the case of the maternal grandfathers is easily accounted for by the more numerous intermarriages between royal households in different countries than would occur in the same family of royalty in one country. That is, maternal grandfathers are, on the average, more closely related than paternal grandfathers, for the ancestral line would more frequently trace back to them. The exceptionally high correlation between great grandparents and their great grandchildren, which is .1528 instead of .075, is also undoubtedly due to inbreeding, which in generations so far removed from each other would be important in a class which intermarries so extensively as do royalty. These figures seem to make out a clear case for heredity as decidedly the principal factor in intellectual and moral qualities, at least in the class considered.

There is one point in this connection which the author has apparently overlooked. The class which he has considered may be assumed to have the most favorable possible environment. This possibly would tend to reduce any disparity between the intellectual and moral qualities of different generations and different individuals arising from difference in environment, leaving in the main only such differences as are due to heredity. If we were to consider a class of people whose environment was such as to tend strongly to repress high aspirations and to disparage high purpose we might find environment a much more important factor in the development of character than it is in royalty. However, the fact that such a study as Dr Woods has made, if made for a different class of our population, might give different results in no way detracts from the high value of the work done. It rather indicates the legitimacy of such study and the necessity of extending it amongst other classes of people.

On pages 283 and 284 the author remarks: "The reasons for the belief that heredity is almost the entire cause for the mental achievements of these men and women, and that environment or free-will must consequently play very minor rôles, may now be summarized: First, the practically perfect results derived from what might be expected of heredity, both from the internal study of the families separately, and from the curves and coefficients of correlation. Second, the fact that environment or opportunity would not cause, in royalty at least, the great names to occur in close blood connection with others of the same stamp."

That the advantages of first sons, who inherit the highest positions, has had no measurable influence — that is, that opportunity laid at one's feet counts for little as compared with inheritance, seems to be substantiated by the facts adduced by the author on pages 286 and 287: "The upshot of it all is that, as regards intellectual life, environment is a totally inadequate explanation. . . . We are forced to the conclusion that all these rough differences in intellectual activity which are susceptible of grading on a scale of ten are due to predetermined differences in the primary germ cells. . . . That these outward circumstances have as much influence as is commonly supposed, or as much as predetermined and congenital causes, are, however, conclusions from which we are forced to dissent. . . ."

"The curves on plate 2 (page 288), with the exception of grade 5, give us results such as we might expect were heredity the sole cause, pure and simple, for moral character." On page 288 is given a diagram showing the average number of moral "deviates," or those in grades as low as 3, which each person possessed as a relative, and shows clearly that "on the average the lower grades had many more of this unfortunate ilk than had the mediocre and higher grades." The fact that morality is not due to environment, at least in the case of royalty, is shown by the fact that degenerates and individuals of high moral character are frequently produced in the same environment, evidently as the result of alternative inheritance.

"It is these strong contrasts, more than anything else, that must lead us to the conclusion that what we have in plate 2 is truly the effect of blood relationship, for environment should not cause this distribution. Spain, France, and Russia give us most of the degenerates. In these countries the individuals are closely associated in blood with insanity, epilepsy, or other psychoses. This is itself a coincidence to be explained by those who doubt that morality is much the result of inheritance." Furthermore: "When strong contrasts are found among the children we always find strong contrasts among the ancestors."

The general results of the study are summed up in the following, which will be found on page 298: "Quality possessed by entire ancestry is almost sure to appear. Quality possessed by one parent and half the ancestry is likely to appear with almost equal force, in one out of every two descendants. Quality possessed by one parent only, and not present in the ancestry, has one chance in about four for its appearance in the progeny. Quality not possessed by either parent, but present in all the grandparents and most of the remaining ancestry, would also have about one chance in two for its appearance in one of the children. If only one of the grandparents possessed the quality in question, then the chance of its appearance in any one of the grandchildren of this ancestor would be only about one chance in sixteen."

The occasional occurrence of a genius from mediocre stock is explained as one of "those fortuitous combinations of ancestral qualities that is destined to make a person inheriting them vary much from any of his kin. . . .' A man of this sort represents the combination of the best from many ancestors."

One can not read this book without feeling that it is a tremendous argument for the application of modern science in the breeding of the ruling classes. Fortunately the influence of these classes is not so great as it was at one time, hence the subject is not so important as it was a few hundred years ago. But Dr Woods has made us feel that heredity is a much more important part in the determination of character than it has had credit for. The sociologist will find this book an inspiration, as it points the way to the improvement of the race, a way which may not be feasible at the present time, but one which will be open in the near future.

In this connection it may not be out of place to mention the fact that the State of Indiana has recently placed on its statute books a law which removes the danger of inheritance from certain of the criminal classes. In operation this law has presented no difficulties.

I repeat that the work which Dr Woods has done in the preparation of his book deserves the careful attention of both the biologist and the sociologist.

W. J. Spillman.

Righthandedness and Lefthandedness, with Chapters Treating of the Writing Posture, the Rule of the Road, etc. By George M. Gould, M.D. Philadelphia and London: J. B. Lippincott Co., 1908. 210 pp., 15 figs.

Besides an Introduction (pp. 7–20) on theories as to the origin of righthandedness and lefthandedness, this book contains eight chapters, as follows: The origin of righthandedness. Why is a particular child righthanded or lefthanded? The rule of the road. Study of a case of two-handed synchronous writing. Visual function the cause of slanted handwriting; its relation to school hygiene, school desks, malposture, spinal curvature, and myopia. The pathological results of righteyedness and lefteyedness. A patient's struggle for right-eye function. The nomenclature of dextral, sinistral, and attentional organs and functions. All these chapters have appeared as articles in the *Boston Medical and Surgical Journal*, the *Long Island Medical Journal*, the *Popular Science Monthly*, the *Medical Record*, *Ophthalmology*, *American Medicine*, chiefly during the year 1907. This necessarily gives rise to some repetition of argument, etc.

The author, known also by his *Biographic Clinics* (1904) and other